

- 34: Proposed line segment
- 35: Proposed effective edge
- 36: Linked line segment
- 37: Whiskers
- 38: Adjusted region

#### 4. Claims:

##### Claim 1

A region calculation method for introducing a two-dimensional association rule, extracted from a database, that includes spatial information, such as addresses, and for applying said two-dimensional association rule for a map, comprising the steps of:

defining an objective function that is used to introduce said two-dimensional association rule;

dividing a region on said map into pixel grids having a predetermined size;

aggregating data available in said database for each of said pixel grids;

employing said objective function to calculate a region for each of said pixel grids;

extracting entities, appearing on said map, that correspond to said obtained region; and

employing said extracted entities to output a region that is applied for said map.

##### Claim 2

The region calculation method according to claim 1, wherein said objective function does not include regional information for which an output request has been submitted.

## Claim 3

The region calculation method according to claim 1, wherein, at said step of dividing said region into said pixel grids, said predetermined size is determined based on the accuracy of the calculation and a calculation time.

## Claim 4

The region calculation method according to claim 1, wherein, at said step of calculating said region of said pixel grid for the optimization of said objective function, said region is calculated based on said objective function and a limitation that are defined.

## Claim 5

The region calculation method according to claim 1, wherein, at said step of extracting said geographical entities, an entity that corresponds to an external frame for said pixel grid is extracted based on a distance from said external frame and an angle relative to said external frame.

## Claim 6

The region calculation method according to claim 1, wherein, at said step of outputting said region, a region wherein entities are connected is displayed on said map, a preferable form that is provided for a user.

## Claim 7

A region calculation method for introducing a two-dimensional association rule extracted from a database, which includes spatial information, such as addresses, comprising the steps of:

defining an objective function used to introduce said two-dimensional association rule;

entering data from said database that includes said spatial information;

aggregating said data to calculate a region for the optimization of said objective function;

entering geographical information;

employing said geographical information to extract entities appearing on a map;

selecting, from said entities, proposed regional edges corresponding to said obtained region; and

displaying said proposed regional edges that are reflected in said geographical information.

#### Claim 8

The region calculation method according to claim 7, wherein said entities on said map are road data.

#### Claim 9

The region calculation method according to claim 7, wherein, at said step of selecting said proposed regional edges, said entities are cut and facilitate the selection of said proposed region edges; and wherein, at said step of displaying said proposed regional edges, which are reflected on said map, said proposed regional edges are linked together for display on said map.

#### Claim 10

The region calculation method according to claim 7, wherein, at said step of displaying said proposed regional edges that are reflected on said map, said proposed regional edges are enhanced to be displayed on said map.

## Claim 11

A spatial data mining apparatus for introducing a two-dimensional association rule extracted from a database, which includes spatial information, such as addresses, comprising:

definition means, for defining an objective function that is used to evaluate said two-dimensional association rule;

input means, for entering geographical information;

division means, for employing said geographical information to divide a region on said map into pixel grids having a predetermined size;

data aggregation means, for extracting data from said database and for aggregating data for each of said pixel grids obtained by said division means;

grid region calculation means, for employing aggregates to calculate the region of a pixel grid that optimizes said objective function;

entity extraction means, for employing said geographical information to extract entities depicted on a map;

proposed edge selection means, for selecting, from among said entities, proposed regional edges that correspond to said region obtained by said grid region calculation means; and

output means, for employing said proposed regional edges to output a region corresponding to said geographical information.

## Claim 12

The spatial data mining apparatus according to claim 11, wherein said proposed edge selection means selects, as

proposed edges, entities lying within a predetermined distance of said external frame of said region obtained by said grid region calculation means.

Claim 13

The spatial data mining apparatus according to claim 11, further comprising:

connection means to connect said proposed edges selected by said proposed edge selection means.

Claim 14

A geographical information display apparatus comprising:

data input means, for receiving data from a database in which data are stored that include attribute information associated with spatial information, such as addresses;

geographical information input means, for entering geographical information, such as road information, that includes entities depicted on a map;

objective function definition means, for defining an objective function that is used for evaluating a region;

aggregate means, for employing said objective function to obtain an aggregate for said data entered by said data input means;

selection means, for employing the aggregate obtained by said aggregate means to select a specific entity from among said entities input by said geographical information input means; and

display means, for displaying a map using said geographical information, and for enhancing and displaying said entity selected by said selection means.

## Claim 15

The geographical information display apparatus according to claim 14, wherein said display means selects, from among said entities, a plurality of effective proposed edges formed of predetermined line segments, and links said effective proposed edges that are displayed.

## Claim 16

A spatial data mining system comprising:

a database in which data are stored that include attribute information associated with spatial information, such as addresses;

a geographical information memory in which geographical information, such as road information, is stored that includes entities depicted on a map;

an input device, for inputting an objective function to be requested for analyzation;

aggregate means, for receiving data from said database and for aggregating said data based on said objective function;

selection means, for receiving a predetermined entity depicted on said map from said geographical information memory, and for employing the aggregate obtained by said aggregate means to select a specific entity from among said entities;

adjustment means, for adjusting said specific entity; and

a display device, for displaying, together with said map stored in said geographical information memory, information for said specific entity that has been adjusted.

## Claim 17

A storage medium on which a program is stored, based on an objective function for which regional information is not provided, to introduce a predetermined region extracted from a database that includes spatial information, such as addresses, said program comprising the steps of:

- obtaining data from said database;
- aggregating said data to calculate a region for the optimization of said objective function;
- entering geographical information;
- employing said geographical information to extract entities depicted on a map;
- selecting, from among said extracted entities, proposed regions that correspond to said region; and
- outputting said selected proposed regions that are reflected in said geographical information.

## Claim 18

The storage medium according to claim 17, wherein, at said step of calculating said region for optimization of said objective function, a region on said map is divided into pixel grids having a predetermined size, and the data for each of said pixel grids are aggregated.